



ZOOLOGICA
SCIENTIFIC CONTRIBUTIONS OF THE
NEW YORK ZOOLOGICAL SOCIETY
FROM THE TROPICAL RESEARCH
STATION IN BRITISH GUIANA



VOLUME III. NUMBER 7

(Tropical Research Station Contribution Number 101)

THE LARVAE AND PUPAE OF THE SOCIAL BEETLES
COCCIDOTROPHUS SOCIALIS (SCHWARZ AND BARBER) AND
EUNAUSIBIUS WHEELERI (SCHWARZ AND BARBER) WITH
REMARKS ON THE TAXONOMY OF THE FAMILY
CUCUJIDAE

By ADAM GIEDE BÖVING, PH.D.

Bureau of Entomology Department of Agriculture, Washington, D. C.

PUBLISHED BY THE SOCIETY
THE ZOOLOGICAL PARK, NEW YORK
DECEMBER 24, 1921

THE LARVAE AND PUPAE OF THE SOCIAL BEETLES
COCCIDOTROPHUS SOCIALIS (SCHWARZ AND BARBER) AND
EUNAUSIBIUS WHEELERI (SCHWARZ AND BARBER) WITH
REMARKS ON THE TAXONOMY OF THE FAMILY
CUCUJIDAE

By ADAM GIEDE BÖVING, PH.D.

Bureau of Entomology Department of Agriculture, Washington, D. C.

Professor W. M. Wheeler has kindly given me for study larvae and pupae of the two species of social beetles discovered by him in British Guiana. The material was plentiful and in excellent condition. In working out the relationship of these larvæ it was necessary to examine larvæ of several related groups and often to avail myself of studies as yet unpublished, undertaken by Dr. F. C. Craighead and myself on the classification of the Coleopterous families based on larval characters.

In addition to descriptions and illustrations of the two species, mentioned above, the present contribution therefore contains a brief discussion of the taxonomy of the entire family Cucujidae.

The different subjects are arranged as follows:

- A. The family Cucujidae, *authorum*; taxonomic remarks with reference to their larvæ.
- B. The subfamily Silvaninae as based on larval characters.
 - B. 1. Subfamily description of the larvæ of the Silvaninae.
 - B. 2. The genera of the Silvaninae, systematically defined by larval characters.
- C. *Coccidotrophus socialis* and *Eunausibius wheeleri*.
 - C. 1. General morphological description of the larvæ.
 - C. 2. Specific description of the larvæ.
 - C. 3. General and specific description of the pupæ.
- D. Bibliographical notes.

A.—THE FAMILY CUCUJIDAE (*authorum*).

The larvae of *Coccidotrophus socialis* Schw. & Barb. and *Eunausibius wheeleri* Schw. & Barb. show remarkable identity in general morphological structures with the larvae of the genera *Oryzaephilus* Gangl., *Silvanus* Latr., *Nausibius* Redt. and *Cathartus* Reiche. All these forms differ from each other only in small details such as the proportional length of the second antennal joint, the arrangement of the individual ocelli in the two ocellar groups, the thickness and color of the chitin of the body or the number and development of the tergal setae. The larva of *Telephanus* (Plate X, figs. 34-38) has a well developed third antennal joint and differs in this and some other less important characters from the genera mentioned. However, it approaches them closely and constitutes together with them a well defined taxonomic unit distinct from the larvae of the rest of those genera which have generally been combined into the single family *Cucujidae*.

This family, however, as hitherto limited, mainly on adult characters, includes larval types which are rather heterogeneous; and according to these different larval types the family can be divided and I propose here to divide it, into several new families and subfamilies.

Thus it appears appropriate to establish the above mentioned unit of genera as a distinct family, the *Silvanidae*.

This family is, through the genus *Telephanus*, closely associated with another unit of genera, namely *Brontes* Fabr. and *Dendrophagus* Schön. (by Gilbert F. Arrow 1901 united into a single genus *Hyliota* Latr.), *Psammoecus* Latr., *Pediacus* Shuck, *Platisus* (according to description and figure by A. M. Lea of *P. integracollis* Reitter; Proc. Linn. Soc. N. S. Wales, vol. 29, 1904, p. 88) and *Cucujus* Fab., which together form a second family, the *Cucujidae* (in restricted sense) with *Brontes*, *Dendrophagus*, with *Psammoecus* in one subfamily, the *Hyliotinae*, and the other genera in another subfamily, the *Cucujinae*. More remote is the relationship between these two families and the genera *Prostomis* Latr. and *Dryocora* (according to my own unpublished

notes and figures of four larvæ of *Dryocora howitti*, from New Zealand; in Zool. Mus. Cambridge, England), which two genera form a third unit and may constitute a subfamily, the *Prostominae* (Plate IX, figs. 22, 24-26 and 27-33). As a fourth unit I consider the genera *Prostominia* (according to the excellent description and figures by M. P. de Peyerimhoff of *P. convexiuscula* Grouv., Trans. Lin. Soc. London—2, Zool.—vol. 17, 1914, p. 156), *Narthe cius* Lec., *Lathropus* Erichs., *Laemophloeus* Laporte, *Dysmerus* Cs., *Hemipeplus* Latr. and *Inopeplus* Smith (according to descriptions and figures by M. P. de Peyerimhoff of *P. praeustus* Chev.), (P. d. P. Ann. Soc. Ent. Fr., vol. 71, 1902-3, p. 715). According to an imperfect description by Weisse (Deutsch. Ent. Zeitsch., vol. 41, 1897, p. 393) of the larva of *Phloeostichus denti collis* Redtb., this genus also belongs to the present unit. All these larvae are closely related to the *Prostominae*, but separated from this subfamily by good characters; they may constitute another subfamily, the *Laemophloeinae* and together with the *Prostominae* the family *Laemophloeidae*. The *Laemophloeidae* are, as the following key will show, separated from the *Silvanidae* and *Cucujidae* (in restricted sense) by exactly the same main character by which such families as the *Cryptophagidae* are separated from the *Mycetophagidae* or the *Monotomidae* (represented by the larva of *Europs*) are separated from the *Smicripidae* (represented by the larva of *Smicrips palmicola* Lec.), namely the different shape of the maxillary mala. The genera *Catogenus* Westw. and *Scalidia* Er., constituting the family *Scalidiidae*, differ to such an extent from all the genera mentioned that their larvae must be placed in another series of families, the *Cleroidea*, proposed by myself in a recent paper (Adam G. Böving and A. B. Champlain, Larvae of North American beetles of the family *Cleridae*, Proc. U. S. Nat. Mus., vol. 57, pp. 588-95). They are, according to Dr. F. C. Craighead (Biology of Colydiidae and Bothrideridae, Proc. Ent. Soc. Wash., vol. 22, pp. 1-13, pl. I, II), closely connected with his new family, the *Bothrideridae*, and appear also to be near to the family *Cleridae*, having like this family protracted ventral mouthparts, large cardo region and elongate gula region (The figs. 39-44, Plate X, are reproduced from unpublished drawings by Dr. Craighead).

The four families with subfamilies, into which the old family Cucujidae may have to be divided according to larval characters, are characterized briefly in the following conspectus:

- I. Mandible with molar structure and complicated hypopharyngeal chitinizations. Ventral mouthparts retracted; cardo in some forms indistinct, fused with enlarged margin of epicranium.
 - A. Maxillary mala (possibly lacinia) falciform, with terminal uncus; externally to uncus a more or less sharply defined, small setose region (possibly reduced galea). Maxillary articulating area distinct.
 1. Without cerci. Eighth abdominal segment normally developed; ninth small, ventrally rudimentary; tenth long, extending far behind ninth segment; six ocelli.....Fam. *Silvanidae*
 - a. Antenna with second joint large and clavate, third joint very small, or wanting; ocelli in two distinct groups (Plate VIII, figs. 10, 12 and 18).....Subfam. *Silvaninae*
 - b. Antenna with three well developed joints; ocelli not in two distinct groups (Plate X, fig. 34).....Subfam. *Telephaninae*
 2. With cerci.....Fam. *Cucujidae*
 - a. Tenth abdominal segment long, conical, extending far behind ninth abdominal segment.....Subfam. *Hyliotinae*
 - b. Tenth abdominal segment short, wartshaped, not extending behind ninth abdominal segment.....Subfam. *Cucujinae*
 - B. Maxillary mala (possibly galea) obtuse, with or without well defined uncus, which when present is laterally placed on inside of mala (possibly terminating a reduced lacinia).....Fam. *Laemophloeidae*

- a. Head larger than prothorax; without ocelli; maxillary articulating area present, cardo distinct; hypostoma normal (Plate IX, figs. 25, 33) Subfam. *Prostominae*
 - b. Head as large as or narrower than prothorax; with ocelli; usually having maxillary articulating area and cardo fused into a joint region, more or less amalgamated with broad enlargement of hypostoma,
Subfam. *Laemophloeinae*
- II. Mandible without molar structure or hypopharyngeal chitinizations; ventral mouthparts protracted; gular region large (Plate X, figs. 41, 42) Fam. *Scalidiidae*

B.—THE SUBFAMILY SILVANINAE.

B. 1.—Systematic Description of the Subfamily Silvaninae

Three pairs of legs. Fused tarsus and claw. Body orthosomatic, dorsally not plicate. Intersegmental membrane present. Ninth abdominal segment small, ventrally reduced. Cerci not developed. Tenth abdominal segment extending farther back than ninth, conical, elongate, a locomotory organ. Holopneustic; spiracles annular; first spiracle plainly mesothoracic. Head porrect and exserted, or slightly invaginated. Clypeus large, fused with frons. Labrum small, fleshy. Antenna two-(three-) jointed, with large clavate second joint, very small or indistinct apical joint. Mandible with flat, broad, molar part; accessory condyle present; retinaculum hamate; apex tri- (or quadri-) fid. Hypopharyngeal chitinizations strong, with paired, ovate, large maxillular area carrying longitudinal series of long setae. Ventral mouthparts retracted. Maxilla with cardo small, transverse, in some forms distinctly bidivided; stipes proximally and internally attached to large maxillary articulating area; mala extending from distal end of stipes, large, simple, falciform, terminated by single uncus; externally to base of uncus with small setose region, in some forms distinctly defined, being white and membranous in contrast to otherwise brown and well chitinized rest of mala. Maxillary palpus three-jointed. Labium

with broad ligula; without or with slightly indicated paraglossae; two jointed labial palp. Mentum—probably fused with submentum—large, barrelshaped, at base attached to maxillary articulating area, otherwise free. Gula large, hexagonal, transverse, interposed between postmaxillary margins of epicranium, the mental-submental area and the anterior prothoracic region.

Apart from the above mentioned, particularly close association with several genera of the old family Cucujidae, the Silvaninae also exhibit a pronounced relationship to the genera of the family Cryptophagidae, to the Monotomidae as represented by the larva of *Europs pallipennis* Lec. and to the genus *Languria*, which together with a few other genera, according to the larval structures, may constitute a distinct family. These larvae have all, like those of the Silvanidae and Cucujidae (restricted) a normally chitinized mandible (compare the Lathridiidae) and a simple and falciform maxillary mala; but they differ from the Silvanid and Cucujid larvae in having before spiracles.

B. 2.—The Genera of the Silvaninae Systematically Defined by Larval Characters.

The Silvaninae are represented in the collections of the U. S. National Museum by the larvae of *Carthartus advena* Waltl, *Nausibius clavicornis* Kugelann, *Silvanus quadricollis* Guérin, *Oryzaephilus surinameensis* Linnaeus, *Coccidotrophus socialis* Schwarz and Barber, and *Eunausibius wheeleri* Schwarz and Barber.

The genera which these larvae represent can be separated as follows:

1. Second antennal joint as long as head (Plate VIII, fig. 12).....*Cathartus* Reiche
Second antennal joint half as long as head or shorter2
2. Second antennal joint half as long as head; upper ocellar group with four ocelli, lower group with two ocelli, or individual ocelli of each group confluent3

- Second antennal joint one-third as long as head;
upper ocellar group with two ocelli, lower with
four 5
3. Mandible apically quadrifid; individual ocelli in each
group well separated; body well chitinized, with
dark brown chitinous shields (Plate VIII, fig.
18), *Nausibius* Redt.
- Mandible apically trifid; individual ocelli in each
group almost confluent; body thinly chitinized,
with pale yellowish shields 4
4. Maxillary palp with length of basal, second and apical
joints as 1:1:2 *Silvanus* Latr.
- Maxillary palp with length of basal, second and apical
joints as 1:2:2 *Oryzaephilus* Gangl.
5. Dorsal shields of abdomen with one long seta on
each side; body very thinly chitinized, creamy
white (Plate VII, fig. 1),
Coccidotrophus Schw. and Barb.
- Dorsal shields of abdomen with two long and a few
short setae on each side; body thinly chitinized,
light grey (Plate VII, fig. 3),
Eunausibius Grouvelle

C.—COCCIDOTROPHUS SOCIALIS AND EUNAUSIBIUS WHEELERI.

C 1.—General morphological description of the larvae.

(Plate VII, figs. 1-8, Plate VIII, figs. 9-11, 13, 16-17)

Orthosomatic with dorsal and ventral sides of body equally developed; thoracic segments not twice as long as seven anterior abdominal segments; lateral sides of body nearly parallel, tapering from eighth abdominal segment posteriorly. Legs ambulatory, of equal size, of medium length and strength; five-jointed, with tarsus and claw fused. Thoracic and abdominal terga not plicate, tergal areas forming shieldlike region. Segments smooth, without gills, thorns or thick pubescence, setae on both thoracic and abdominal segments. Ten abdominal segments

present; ninth small, ventrally reduced (*9* Plate VII, figs. 1 and 2), without cerci; tenth (*10* Plate VII, figs. 1 and 2) elongate conical, developed as a locomotory organ with extrusible, membranous anal lobes (*l* Plate VIII, fig. 2).

Head exserted beyond, or slightly retracted into anterior portion of prothorax; type of head porrect with frons horizontal and mouthparts stretched forward; form of head subtriangular with posterior part broader. Occipital foramen posterior, annular, dorsally limited by hind margin of epicranium, ventrally by hind margin of gular plate (*gu* Plate VII, fig. 7). No collum. Frons lyriform, one pair of oblong spots where frontal sutures anteriorly begin to diverge (Plate VIII, fig. 9). Frons and clypeus fused. Clypeus large, projecting to near tip of mandible, trapezoidal with sides converging forward, chitinized. Labrum short, soft and whitish, developed as a fleshy anterior margin of clypeus (Plate VIII, fig. 9). Epicranical halves dorsally entirely separated by frons; no median, epicranical suture; hypostoma (the epicranial margin between ventral articulation of mandible and attachment of posterior tip of cardo) (*hy* Plate VII, fig. 7) longitudinal with transverse curvation below cardo; epicranial margin longitudinally continued from tip of cardo to foramen occipitale. Gula median, unpaired, hexagonal, without parangular regions, chitinous, forming the ventral base of cranium between mentum (or probably fusion of mentum and submentum), the maxillary articulating area (*r* Plate VII, fig. 7), the epicranium and the presternal region of prothorax. Hypopharyngeal chitinization (*hpy. ch.* Plate VIII, fig. 16) (= lingua, Folsom), at entrance to pharynx, strong, triangular, considerably wider than long, with tuft of long setae at each end; between tufts surface covered with numerous small, irregularly arranged rugosities. Coming from hypopharyngeal chitinization, creating firm support for same, is the following system of five pairs of chitinous rods: First pair (= lingual stalks, Folsom) (*1* Plate VII, fig. 8, Plate VIII, fig. 16) connecting hypopharyngeal chitinization with anterior corner of gular plate, perpendicular, parallel, imbedded in membrane between articulating area of maxilla and lateral side of base of mentum (or probably submental part of fused mentum—submentum). Second pair of rods (=hypopharyngeal

bracons, Hopkins) (2 Plate VII, figs. 6, 8, Plate VIII, fig. 16) connecting hypopharyngeal chitinization with that region of epicranium which carries fossa for mandibular condyle; horizontal, transverse, imbedded in buccal membrane between mandible and dorsal side of maxillary stipes. Third pair of rods (3 Plate VII, figs. 6, 8, Plate VIII, fig. 16) situated immediately in front of and parallel with anterior margin of hypopharyngeal chitinization; horizontal, converging anteriorly, meeting in middle line. Fourth pair (4 Plate VII, figs. 6, 8, Plate VIII, fig. 16) supporting and externally limiting the maxillular areas, vanishing distally near glossa (= buccal surface of ligula) (*glos.* Fig. 16); horizontal, longitudinal and parallel. Fifth pair (5 Plate VII, figs. 6, 8, Plate VIII, fig. 16) forming a posterior prolongation of fourth pair of rods, imbedded in sides of oesophagus; horizontal, longitudinal and parallel; proximally, near hypopharyngeal chitinization, with fossa for accessory mandibular condyle (*fos. a. c. m.* Plate VIII, fig. 16), distally gradually vanishing.* Maxillular areas (*sensu* H. T. Hansen, = superlingua Folsom). (*mxl* Plate VIII, fig. 16) fleshy, ovate, anteriorly fused together, posteriorly well separated, limited externally by fourth and internally by third pair of rods; along third pair with a series of well developed, closely set setæ. Glossa (= buccal surface of ligula-lingua, Schiödte) (*glos.* Plate VIII, fig. 16) unpaired, fleshy, in front of maxillular area, laterally supported and limited by a pair of longitudinal, horizontal, chitinous rods (*stp. li.* Plate VIII, fig. 16); similar to the fourth hypopharyngeal pair. Epipharynx (Plate VIII, fig. 11) consisting of anterior and posterior part. Anterior part a direct ventral continuation of labrum; soft, membranous, medially on the hind margin with a small triangular asperity, which fits in between the scissorial parts of the closed mandibles; well developed tendons (*t* Plate VIII, fig. 11) extending from each back-corner; some long setæ. Posterior part of epipharynx slightly chitinized, with several transverse, long, curved, parallel wrinkles. Tentorium an internal cranial structure, differing in that respect from the two mentioned systems of chitinizations in

* The pair of rods is not present which in many other Coleopterous larvae extends from proximal ends of fifth pair, along sides of epipharynx, towards end of large movable labrum.

the buccal membrane above labium and above the mental-submental area; consisting of a median broad and short, slightly chitinized, transverse tentorial bridge (*ten. b.* Plate VII, fig. 7), situated a short distance above gular plate and of two pairs of tentorial arms; the first pair of arms lateral (*t. l. a.* Plate VII, fig. 7), between bridge and tentorial pits (*tp.* Plate VII, fig. 7) where gular plate and epicranium meet; the second pair anterior (*t. a. a.* Plate VII, fig. 7), reaching from tentorial bridge toward the dorsal side of cranium, their external ends distally indistinct. Ocelli (Plate VIII, fig. 10) six, placed in two groups, a lower behind mandible and an upper straight behind antenna and right above first group. Antenna with large basal membrane, two- (three-) jointed; basal joint (1 Plate VII, fig. 5) short, second joint (2 Plate VII, fig. 5) long, claviform, with tip (3 Plate VII, fig. 5) more or less distinctly separated as a small additional joint. Mandible (Plate VII, figs. 4 and 5) with molar part, retinaculum and accessory ventral condyle; half as long as head; apical part (*p. sc.* Plate VII, fig. 5) distinctly constricted, incurved, vertically compressed, fornicate, cleft with some toothlike ends; rest of mandible horizontally flat, subtriangular with wide base; retinaculum present (*r* Plate VII, fig. 5), hamate, short, pointed, with enlarged socket; molar part broad (*m.* Plate VII, fig. 5, Plate VIII, fig. 17), compressed, with dorsal surface smooth, ventral surface roughened by numerous granules, these being anteriorly rather large and irregularly distributed, posteriorly minute and densely placed in longitudinal rows; basal molar fringed with a series of anomalous, chitinous, stiff, filamentous processes (*fil. pr.* Plate VIII, fig. 17), which gradually diminish in length from inner corner of basis toward accessory condyle; accessory condyle (*acces.* Plate VIII, fig. 17), as mentioned above, fitting into groove (*fos. a. c. m.* Plate VIII, fig. 16) in fifth hypopharyngeal rod.* Ventral mouthparts

* This articulation between the mandibles and the whole system of amalgamated chitinous hypopharyngeal and epipharyngeal structures indicates that the side to side movements of the mandibles caused by extensor-flexor—(= abductor-adductor)—muscles, always must be coincident with the forward-backward movements of the following closely united structures: the anterior portion of oesophagus, the hypopharynx with other buccal structures, and the ventral mouthparts, and also coincident, when a free, well-developed labrum and movable clypeus are present, with their up and down nodding motions. All forward and upward directed movements are caused by blood pressure combined with special arrangements of the articulations; all backward and downward directed movements by retractor muscles.

retracted with tip of cardo articulating at considerable distance behind the ventral condyle of the mandible (*vc.* Plate VII, fig. 7); hypostomal curvation adjacent to both stipes and cardo. Maxillary articulating area large, membranous, placed between stipes, maxillae, cardo, gular plate and posterior part of the mental-submental region. Cardo maxillaris approximately transverse, bidivided, much narrower than long, tip articulating with hypostoma at distinct distance from occipital foramen. Stipes maxillaris connected with the articulating area along the proximal two-thirds of its inner margin; distal part free. Mala (=maxillary lobe) (*lac* Plate VIII, fig. 16) simple, projecting as a direct anterior continuation of stipes, apically attenuate, terminating with a single, well developed uncus (*u* Plate VIII, fig. 16); external apical part of mala (*gal* Plate VIII, fig. 16) soft-skinned with some strong, straight setae behind uncus: * inner margin of mala set with strong setae. Palpiger maxillaris (*plg. mx.* Plate VIII, fig. 16) well developed, subtriangular. Maxillary palp well developed, three-jointed. Submentum probably fused with mentum, forming together a barrelshaped, free unit (*m* Plate VII, fig. 7). Labium (proper) posteriorly limited by a chitinous bow, extending between the ends of those rods which laterally support and limit the glossa; palpiger labii not distinctly chitinized. Ligula (*lig* Plate VII, fig. 7) broad. ** Labial palp short, two-jointed. Between head and prothorax there is a well developed cervical membrane, capable of being invaginated into and protruded from the anterior part of prothorax. Thoracic segments similar in size and development. Prothoracic presterna (*prst 1* Plate VII, fig. 7) large broad, oval,

* Possibly corresponding to galea, while chitinized rest of mala is lacinia (*lac* Plate VIII, fig. 16).

** The term "ligula" (= glossa, Folsom) is here applied to the median, terminal labial lobe, which is composed of the fused right and left labial malae. For descriptive purposes it appears practical to use special terms for the ventral and buccal surfaces of this lobe; the term "ligula" is here applied only to the ventral surface (*lig* Plate VII, fig. 7), while the buccal surface is mentioned as "glossa" (*glos.* Plate VIII, fig. 16). The structure which Schiödte calls "ligula" is not identical with the entire labial lobe in question, as he designates as the ligula only a special, jointed, terminal part of the lobe; the rest, or, when no jointed terminal part is developed, the entire lobe Schiödte calls "lingua," and he applies this term both to the ventral and buccal surfaces.

adjacent to a medium, simple, elongate, suboval eusternal sclerite (*eu* Plate VII, fig. 7); furcal pits (*fur* Plate VII, fig. 7) near inside of legs. A well developed triangular poststernellum (*pstl* Plate VII, fig. 7) present. Between pro- and mesothorax and between meso- and metathorax a well developed intersternal ring consisting of the poststernal area (*pstl.* Plate VII, fig. 7) of the anterior and the presternal areas (*prst* Plate VII, fig. 7) of the posterior or two connected segments. Presternal areas of meso- and metathorax, subtriangular, dorsally only slightly separated from the spiracle-bearing préépipleural areas of the segments. Hypopleural areas, above coxae, separated by a distinct, short, perpendicular, chitinous line extending from coxal hinge into an anterior subdivision, prehypopleurum (=episternum *authorum*), and a posterior one, posthypopleurum (=epimeron *authorum*). Legs inserted widely apart (*leg* Plate VII, fig. 7). Abdominal segments, from first to eighth, differing only slightly in size and shape, about as wide as thoracic segments, somewhat shorter. Intersegmental membranes, indistinctly developed dorsally and laterally, more distinctly ventrally. Each abdominal segment with tergal areas fused, with poorly defined, low epipleural area without lobe or other subdivisions, with hypopleurum large, somewhat bulging, dorsally clearly limited by a ventro-lateral suture, ventrally less sharply defined; sternal areas more or less fused. Ninth and tenth abdominal segments mentioned above (p. 204). Spiracles annular (Plate VII, fig. 2, Plate VIII, fig. 13), not very conspicuous; mesothoracic twice as large as abdominal; metathoracic rudimentary; both meso- and metathoracic spiracles—as already mentioned—located in préépipleurum; abdominal spiracles all lateral and of same size, located in the tergal regions medially or posteriorly near the rather indistinct dorsolateral suture. One pair of small chitinous spots present dorsally on the thoracic segments; one pair dorsally and one pair ventrally on most of the abdominal segments. Rounded, soft organs, shaped like cloverheads attach internally to these spots; function unknown.

*C. 2.—Specific Description of Larvae of Coccidotrophus socialis and Eunausibius wheeleri.**Coccidotrophus socialis* Schwarz and Barber

(Described from specimens preserved in U. S. National Museum.)

(Plate VII, figs. 1 and 2.)

Mature Larva:

Length about 4 mm. Width of prothorax about 1 mm. Whitish, very thinly chitinized. Head with width to length as 1:1½. Length of head and thorax, together in proportion to abdomen as 3:5. Ocelli four in a lower, square group, two in an upper group. Frons with short setae sparsely scattered over the surface; the paired spots at frontal sutures yellow. Clypeal region anteriorly with transverse series of four long setae, laterally with one long seta on each side, several short setae scattered over entire surface. Labrum, with several very short setae. Another part of epipharynx with four long setae along the front margin and one long seta on each side near the attachment of the epipharyngeal tendon; posterior part of epipharynx without setae. Hypostoma about half as long as lateral outline of epicranium. Epicranial postmaxillary margin about half as long as cardo. Epicranium, with a few long and some short setae scattered over the surface. Antenna about half as long as head from front margin or labrum to occipital foramen; basal antennal joint about half as long as second joint (soft-skinned apical part excluded), subcylindrical, twice as long as wide; second antennal joint clubshaped, with end twice as wide as base, almost one-third as long as length of head; tip of antenna membranous, whitish, low, rounded, not distinctly set off from second joint; no supplementary appendix; a ring of densely set spinules present on distal end of basal joint, numerous thin and medium long or short setae irregularly scattered over the whole surface of second joint. Mandible with apical part trifid, several setae of different sizes on exterior lateral mandibular region. Each maxillular area ovate, membranous; individual setae belonging to series along inner margin of medium size, somewhat curved, bending outward. Maxilla, with end of cardo articulating at a distance from occipital foramen,

somewhat more than half the length of cardo; free distal part of stipes dorsally with one long seta; mala with inner margin set with two parallel series of strong, somewhat curved setae; palpiger maxillaris with a few minute setae; maxillary palp well developed, surpassing tip of mala by one-half the length of the apical joint, with basal joint cylindrical, somewhat wider than long; second joint cylindrical, as wide as long; apical joint slightly conical, almost as long as the two other joints together, half as wide; front margin of two posterior joints with minute spines in a ring; apical joint with one long seta and terminally with several sensory papillæ. Submentum with two pairs of setae. Ligula anteriorly rounded, with several rather short setae; no paraglossae. Labial palp about as long and wide as the apical joint of the maxillary palp; basal joint about two-thirds of the entire length of labial palp; apical joint anteriorly obtusely rounded and provided with many minute sensorial projections. Thoracic segments almost equally developed, each about as wide and long as head; weak line present between furcal pits, separating an anterior eusternal region from a posterior sternellar region; poststernellar areas of pro- and mesothorax well developed, marked with a median chitinous spot. Prothorax with eusternal sclerite as wide and somewhat longer than each prothoracic presternum. Thoracic tergal shields with one seta on each side, the prothoracic rather short; meso- and metathorax with one yellow spot anteriorly to the seta. Legs with coxa about as long as clypeal region, slightly longer than thick; trochanter half as long as coxa; femur and tibia of equal size, slender, each slightly longer than second antennal joint, about four times as long as thick; clawshaped tarsus not quite as long as basal antennal joint. Eight anterior abdominal segments with tergal shields carrying along the hind margin a series of seven to eight setae on each side of middle line; one seta, externally placed, very long, the others very small; scattered all over the whole surface of shield, numerous, extremely minute setae. In front of long seta with yellow, chitinous spot. Spiracles posteriorly placed, below the shields. Epipleurum narrow, without seta. Hypopleurum with large median lobe and one long seta; sternal areas on each side with two long setae and one yellow chitinous spot. Ninth abdominal segment only represented by small tergal part, about as large

as hypopleurum of eighth abdominal segment, with one small seta and some very minute scattered over whole surface. Tenth abdominal segment as long as one of the well developed abdominal segments, conical, one and one-half times as long as wide; a ring of small setae right above the truncate end; also with very minute setae scattered over whole surface. Mesothoracic spiracle about as large as base of claw, situated on top of small softskinned conical tube; abdominal spiracles half as large and not on tubes.

Newly hatched larva:

Length 1 mm. Width of prothorax 0.25 mm. Length of head and thorax together about as long as abdomen. One very long seta on each side of hind margin of tergum; setae corresponding to the small setae along hindmargin comparatively longer than those of mature larva; no setae corresponding to minute setae on the whole tergal surface.

Eunausibius wheeleri Schwarz and Barber.

(Described from specimens preserved in U. S. National Museum.)

Mature Larva:

Length, about 3.5 mm. Width of prothorax, about 0.75 mm. Length of head and thorax combined, in proportion to length of abdomen, about as 3:5. Shields thinly chitinized, light grey, shiny. Both thoracic and abdominal segments along hindmargin with a series of six to seven setae on each side; two sets very long, the others short; rest of tergal shield smooth with a few very minute setae. Abdominal hypopleurum with one long and one short seta. Otherwise like *Coccidotrophus socialis*, to which larva it is very closely related.

C 3.—General and specific description of the Pupae of Coccidotrophus socialis and Eunausibius wheeleri.

(Plate IX, figs. 19-21, 23)

General Description.

Body somewhat depressed; about five times as long as width of prothorax. Head large and wide; not to be seen from above;

with four or five very minute spinules on dorsal surface. Prothorax flat, subrectangular; with length to width at 1.25:1.00; anterior third slightly broader than rest; anterior corner somewhat rounded; posterior corner rectangular; with one setiferous protuberance at each anterior corner and a few along the sides, otherwise entirely smooth. Meso- and metathorax smooth. Abdomen with third segment the widest and as wide as prothorax; first and second abdominal segments slightly narrower; posterior segments gradually decreasing to the seventh, which anteriorly is half as wide as the third and posteriorly only two-thirds as wide as anteriorly; eighth to ninth abdominal segments small, forming together a rounded almost semicircular termination of body. Second to seventh abdominal segments laterally with small protuberances, without setae; ninth abdominal segment dorsally terminating with two small, slender, cylindrical, divergent cerci. Spiracles annuliform, located on meso- and metathorax and on the first to eighth abdominal segments, where lateral protuberances develop spiracles placed immediately above and in front of these. Pouch covering elytron extending to posterior margin of fourth abdominal segment, smooth, with four well marked longitudinal ribs. Tarsal cover of hind legs ventrally extending to middle of fourth abdominal segment; the entire leg-pouch smooth. Antennal pouch short, clubshaped, directed backward and outward; ends of the last three or four joints marked by a ring of small projections.

Specific Characterization.

Coccidotrophus socialis Schwarz and Barber.

(Pupa described from specimens preserved in the U. S. National Museum).

(Plate IX, figs. 19-21)

Length, about 4 mm. White. Prothorax with anterior lateral protuberance small, but distinct, three posterior lateral protuberances much reduced, not to be seen with naked eye or ordinary lens magnification.

Eunausibius wheeleri Schwarz and Barber

(Pupa described from specimens preserved in the U. S. National Museum)

(Plate IX, fig. 23)

Length, 3-4 mm. Grey. Prothorax with five lateral protuberances well developed, to be seen with naked eye or ordinary lens. (On specimen figured one protuberance was—abnormally—not developed on left side.)

D.—Bibliographical Notes.

A careful list of the descriptions and figures of the larvae of the family Cucujidae (*auth.*), including reference to P. de Peyerimhoff's key for the determination of the larvae of the Cucujid genera, is given by F. H. Gravely (in Records of the Indian Museum, Calcutta, vol. II, 1915, pp. 353-358).

To this list might be added the part dealing with this family in L. Ganglbauer: Die Käfer von Mitteleuropa, vol. III, part 2, 1899. Since the list of Gravely was published an important work has appeared by U. Saalas: Die Fichtenkäfer Finnlands (in Annales Academiae Scientiarum Fennicae Ser. A, vol. VIII, 1917 pp. 508-528, figs. 119-130). In Saalas' book are described and splendidly figured with habitus and detail drawings the following larvae (and pupae): *Pediacus fuscus* Er., *Laemophloeus abietis* Wank, *Laemophloeus alternans* Er.

Finally I may mention that the larva described and figured by C. V. Gernet as "Cucujiden-Larve" (*Dendrophagus crenatus* Payk) is in my opinion a *Staphylinid* larva of the group Aleocharini. The figure shows the combination of a mandible without mola and jointed cerci, movable at base, which is characteristic of the Staphylinids; and also a large movable labrum, a single ocellus and broad ligula, which characters define the Aleocharini.

The newest taxonomic arrangement of the Cucujidae is presented by Charles W. Leng in: "Catalogue of the Coleoptera of America, North of Mexico," Mount Vernon, N. Y., John D. Sherman, 1920. The arrangement of the larvae given in the present paper does not agree so well with Mr. Leng's list as with the system presented in 1899 in L. Ganglbauer's "Käfer von Mitteleuropa."

Plate VII.

(Figures drawn by A. G. Böving).

- Fig. 1. *Coccidotrophus socialis*. Dorsal view of larva.
Fig. 2. *Coccidotrophus socialis*. Side view of larva.
Fig. 3. *Eunausibius wheeleri*. Dorsal view of larva.
Fig. 4. *Coccidotrophus socialis*. Right mandible from above.
Fig. 5. *Coccidotrophus socialis*. Right mandible from below.
ac, accessory condyle; *f*, chitinous appendices from base of mola; *flx*, tendon of flexor mandibulæ; *m*, mola; *psc*, pars scissoria; *r*, retinaculum; *v*, ventral condyle of mandible; *1-2-3*, first-second-rudimentary third antennal joints.
Fig. 6. *Coccidotrophus socialis*. Hypopharyngeal rods in buccal membrane. Dorsal surface of ventral mouthparts. *1-2-3-4-5*, see explanation of Fig. 16, Plate VIII.
Fig. 7. *Coccidotrophus socialis*. Head, Prothorax and Mesothorax from below. *a1-a2*, first and second antennal joints; *b*, bracon (= second hypopharyngeal rod); *bm*, basal membrane of antenna; *est*, eusternum; *eu*, eusternal plate of prothorax; *fur*, pit indicating attachment of furca; *gu*, gula; *leg*, basis of leg; *lig*, ligula; *m*, mentum and submentum fused; *prst*, *1*, *2* and *3*, presternum; *pstl* *1* and *2*, poststernellum of first and second thoracic segments; *r*, *sp.*, rudimentary spiracle of metathorax; *sp*, spiracle of mesothorax; *stl*, sternellum; *taa*, anterior arm of tentorium; *tenb*, bridge of tentorium; *tl*, lateral arm of tentorium; *tp*, tentorial pit, longitudinal groove, indicating attachment of lateral arm of tentorium; *stl*, sternellum; *vc*, mandibular fossa of epicranium.
Fig. 8. *Coccidotrophus socialis*. Ventral surface of ventral mouthparts. *1-2-3-4-5*, five hypopharyngeal rods, see explanation of Fig. 16, Plate VIII.

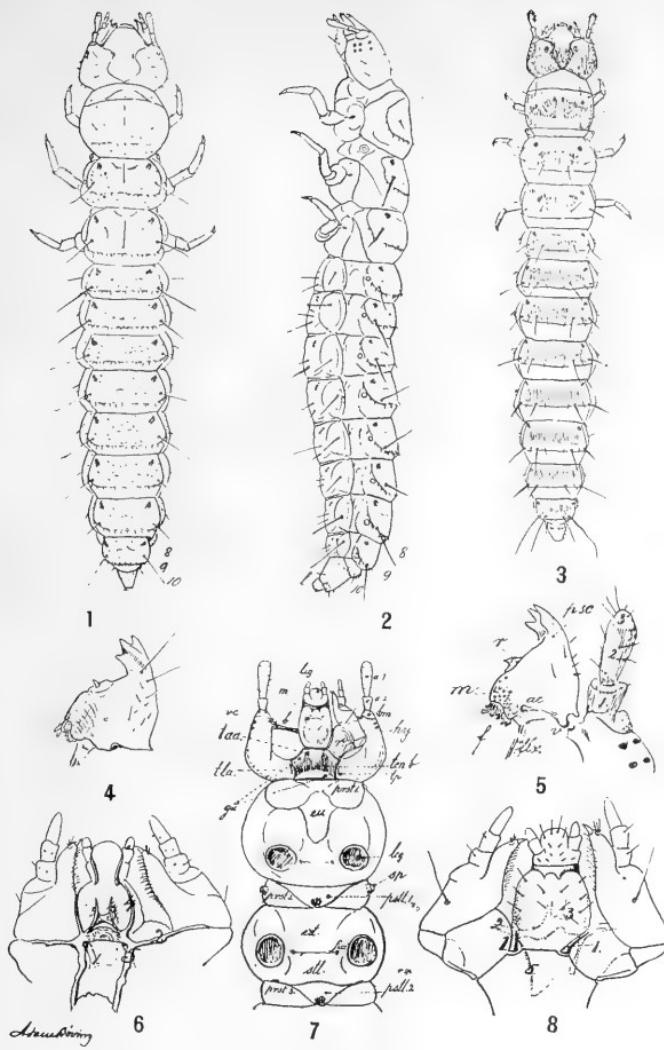


Plate VII

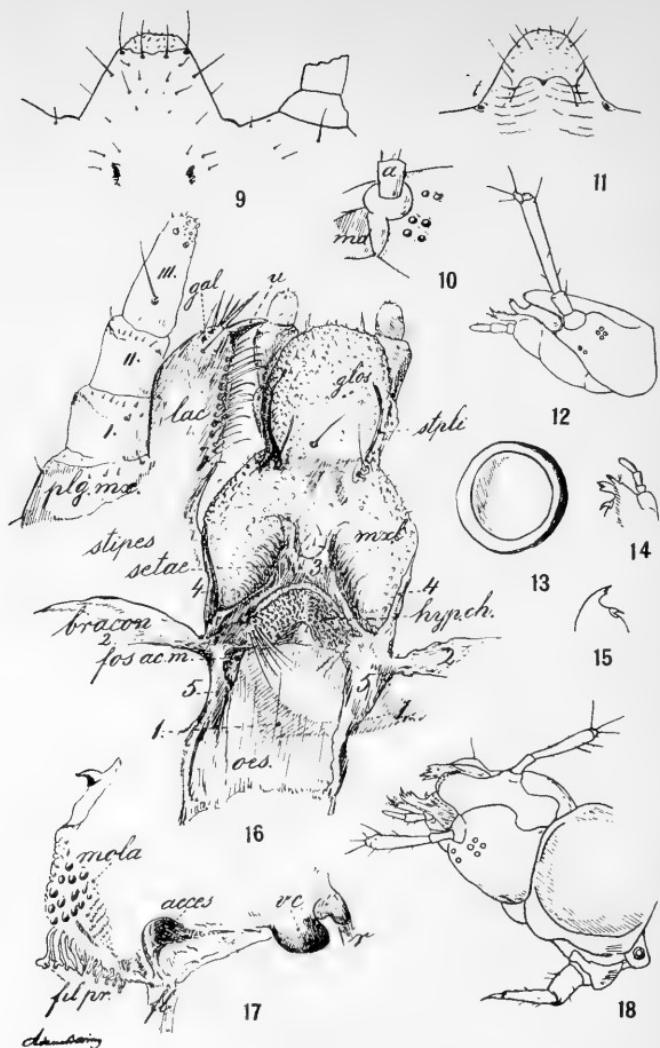


Plate VIII

Plate VIII.

(Figures drawn by A. G. Böving).

Fig. 9. *Coccidotrophus socialis*. Anterior part of head from above, showing frons with chitinous spots, clypeus fused with front, membranous short labrum, basis of antenna.

Fig. 10. *Coccidotrophus socialis*. Anterior part of head from right side, showing basis of antenna basis of mandible, upper group of two ocelli, lower group of four ocelli.

Fig. 11. *Coccidotrophus socialis*. Epipharynx.

Fig. 12. *Cathartus advena*. Head from left side.

Fig. 13. *Coccidotrophus socialis*. Spiracle, highly magnified.

Fig. 14. *Cathartus advena*. Anterior part of left mandible and maxilla from below.

Fig. 15. *Cathartus advena*. Anterior part of left mandible from above.

Fig. 16. *Coccidotrophus socialis*. Maxilla, hypopharynx, maxillular area and glossa (= dorsal surface of ligula) facing buccal cavity; bracon, second chitinous rod from hypopharyngeal chitinization; *fos. ac. m*, fossa for the accessory mandibular condyle in base of hypopharyngeal chitinization (*acces*, fig. 17, Plate VIII); *gal*, possibly rudimentary galea; *glos*, glossa; *hyp. ch*, hypopharyngeal chitinization; *lac*, lacinia; *mxl*, maxillular area; *oes*, oesophagus; *plg. mx*, palpiger maxillæ; *u*, uncus; *setae*, setae along chitinous rod number three; *stipes*, dorsal surface of stipes maxillæ; *stpli*, chitinous rod between glossa and palpiger labii; *1-2-3-4-5*, chitinous rods from hypopharyngeal chitinization; *I-II-III*, basal, second, apical joints of palpus maxillaris.

Fig. 17. *Coccidotrophus socialis*. Posterior part of left mandible from below; *acces*, accessory condyle fitting into fossa in base of hypopharyngeal chitinization (*fos. ac. m*, fig. 16, Plate VIII); *fil. pr*, stiff chitinous filaments; *fl*, tendon of flexor mandibulæ; *mola*, granular ventral surface of the molar structure; *r*, tendon of retractor mandibulæ; *vc*, ventral condyle of mandible fitting into fossa of epicranium (*vc*, fig. 7, Plate VII).

Fig. 18. *Nausibius repanda*. Head and anterior part of thorax.

Plate IX.

(Figures drawn by A. G. Böving).

- Fig. 19. *Coccidotrophus socialis*. Pupa; left side.
- Fig. 20. *Coccidotrophus socialis*. Pupa; dorsal side.
- Fig. 21. *Coccidotrophus socialis*. Pupa; ventral side.
- Fig. 22. *Prostomis mandibularis*. (Denmark, Europe), Maxilla;
mx. art. a., maxillary articulating area.
- Fig. 23. *Eunausibius wheeleri*. Pupa; left side. (Specimen
slightly abnormal, having only four lateral projec-
tions on left side).
- Fig. 24. *Prostomis mandibularis*. Larva from above.
- Fig. 25. *Prostomis mandibularis*. Head from below.
- Fig. 26. *Prostomis mandibularis*. Terminal part of abdomen
from below.
- Fig. 27. *Dryocora howitti* (New Zealand). Maxilla.
- Fig. 28. *Dryocora howitti*. Mandible.
- Fig. 29. *Dryocora howitti*. Ninth abdominal segment from
above.
- Fig. 30. *Dryocora howitti*. Ninth abdominal segment, left side
- Fig. 31. *Dryocora howitti*. Head; dorsal side.
- Fig. 32. *Dryocora howitti*. Larva from above.
- Fig. 33. *Dryocora howitti*. Head; ventral side.

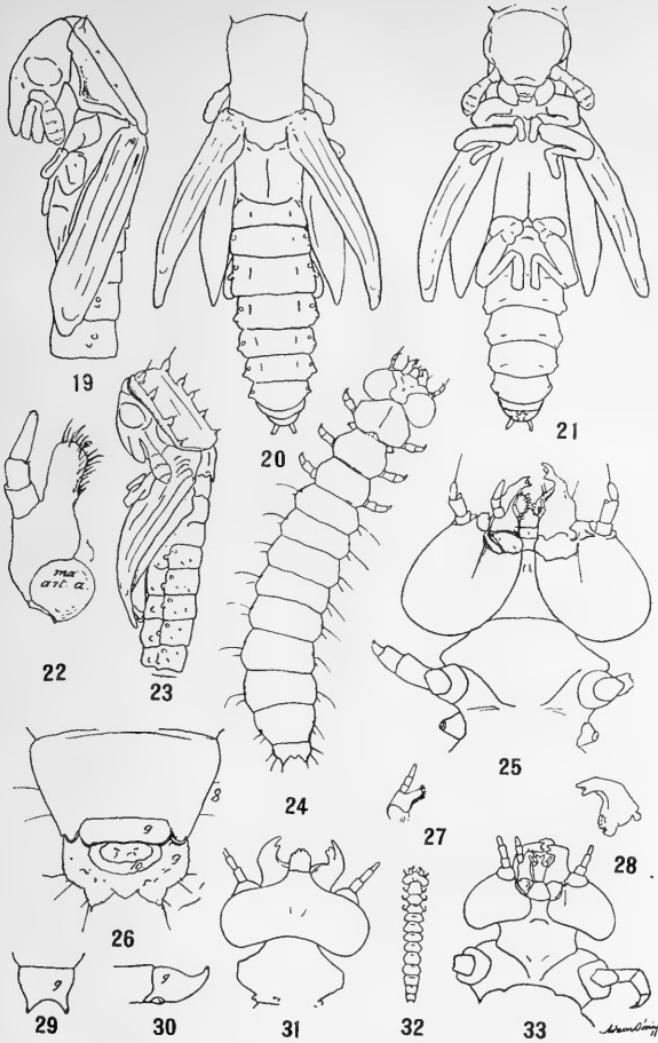
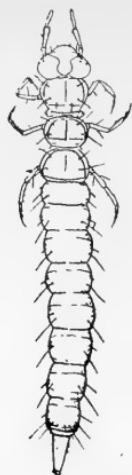


Plate IX



37



34



35



36



38



39



40



42



41



43



44

Mauritius

Plate X

J.C. Craighead

Plate X.

(Figures 34-38 drawn by A. G. Böving).
(Figures 39-44 drawn by F. C. Craighead).

- Fig. 34. *Telephanus pallidulus* (Rio Piedras, Porto Rica). Head; left side.
- Fig. 35. *Telephanus pallidulus*. End of abdomen; left side.
- Fig. 36. *Telephonus pallidulus*. Left mandible; ventral surface.
- Fig. 37. *Telephanus pallidulus*. Mature larva; dorsal side.
- Fig. 38. *Telephanus pallidulus*. Maxillæ, glossa, maxillular area, hypopharyngeal chitinization, oesophagus; facing buccal cavity.
- Fig. 39. *Scalidia linearis* Lec. Head; dorsal side. (Note: No distinct clypeus, large movable labrum).
- Fig. 40. *Scalidia linearis*. Leg.
- Fig. 41. *Scalidia linearis*. Right mandible; dorsal surface. (Note: No molar structure).
- Fig. 42. *Scalidia linearis*. Head; ventral surface. (Note: Protracted mouthparts; large region formed by fusion of cardines, mentum and submentum; also large region formed by fusion of epicranial halves and gula).
- Fig. 43. *Scalidia linearis*. Spiracle; annuliforme.
- Fig. 44. *Scalidia linearis*. Left side of the mature, parasitic larva.



QL Wheeler, William Morton.
591 Study of some social
B74W48 beetles in British Guiana,
Ent. 1921.

